Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Coordinate geometry of the circle

Time allowed: 1 hour 40 minutes

Subject code **0606**

Additional Mathematics

Questions from Paper 1 and Paper 2

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
Questions 1-2, 4-5, 7-8 (Paper 1): no calculator.
Questions 3, 6, 9-10 (Paper 2): calculator allowed.

Total marks

/ 64

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 64 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 The point A has coordinates $(-3, 6)$.
The point B has coordinates $(7, -8)$.

Given that the line AB is the diameter of a circle, find the equation of the circle. [4]

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2 Find the coordinates of the points where the line $2y = x - 1$ meets the curve $x^2 + y^2 = 29$. [5]

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3 **Solutions to this question by accurate drawing will not be accepted.**

A circle has centre (4, 2) and meets the x-axis at $(-2, 0)$.

(a) Find the equation of the circle. [2]

(b) Find, in exact form, the coordinates of the points where the circle meets the y-axis. [3]

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4 The point A has coordinates $(-2, 4)$.
The point B has coordinates $(6, 10)$.
The point C has coordinates $(12, 2)$.

(a) Find the gradients of the lines AB, AC and BC. [2]

(b) Hence find the equation of the circle which passes through the points A, B and C. [4]

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5 Solutions by accurate drawing will not be accepted.

A circle, C, has equation $(x-5)^2+(y-12)^2=100$.

(a) Find the equation of the tangent to C at the point (11, 4).
Give your answer in the form $ax+by=c$, where a, b and c are integers. [4]

(b) Show that C and the circle with equation $x^2+y^2=4$ do not intersect. [2]

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6 A circle has equation $x^2 + y^2 - 25 = 0$.
A second circle has the same radius as the first circle, and the coordinates of its centre are both positive.
The two circles intersect at the points A and B.
The line AB has length 6 and is parallel to the line $y = -x$.

Find the equation of the second circle in the form $x^2 + y^2 + ax + by + c = 0$, where a, b and c are constants. [5]

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7 The lines $x = 0$, $x = 4$, $y = 3$ and $y = -1$ are tangents to a circle.

(a) Find the equation of the circle. [3]

The line $y = 2x + a$, where a is a constant, is also a tangent to the circle.

(b) Show that $5x^2 + 4(a-2)x + (a-1)^2 = 0$, and hence find the possible values of a. Give your answers in exact form. [4]

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8 A circle with centre C has the equation $x^2 + y^2 - 10x - 4y + 24 = 0$.

(a) Show that the line $y = 2x - 3$ is a tangent to this circle. [3]

(b) Given that this tangent touches the circle at the point P, find the coordinates of P. [2]

(c) Find the equation of the circle which has its centre at P and passes through the origin. [3]

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9 **(i)** Calculate the coordinates of the points where the line $y = x + 2$ cuts the curve $x^2 + y^2 = 10$. [4]

(ii) Find the exact values of m for which the line $y = mx + 5$ is a tangent to the curve $x^2 + y^2 = 10$. [4]

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10 The line $y = kx - 4$, where k is a positive constant, passes through the point $P\,(0, -4)$ and is a tangent to the curve $x^2 + y^2 - 2y = 8$ at the point T. Find

(i) the value of k, [5]

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(ii) the coordinates of T, [3]

(iii) the length of TP. [2]

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